yli130_Assignment_2

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```
# using the library
library(lpSolveAPI)

# set the work directory
setwd("C:/Users/yanxi/OneDrive - Kent State University/Desktop/Quantitative Management Modeling/Assignme
```

Create LP model Objects

```
# create the LP model object using make.lp.
lprec <- make.lp(9, 9)   # (9,9) means 9 constraints and 9  decision variables
```

Objective function

P(profit) = 420$L1$ + 420L2 +420$L3$ + 360M1 + 360$M2$ + 360M3 + 300$S1$ + 300S2 +300*S3

```
# set object function
set.objfn(lprec, c(420,420,420,360,360,360,300,300,300))
# set the maximum profit
lp.control(lprec, sense='max')
```

```
## $anti.degen
## [1] "fixedvars" "stalling"
##
## $basis.crash
## [1] "none"
##
## $bb.depthlimit
## [1] -50
##
## $bb.floorfirst
## [1] "automatic"
##
## $bb.rule
## [1] "pseudononint" "greedy"       "dynamic"      "rcostfixing"
##
## $break.at.first
## [1] FALSE
##
```

```
## $break.at.value
## [1] 1e+30
##
## $epsilon
##       epsb       epsd      epsel     epsint epsperturb   epspivot
##      1e-10      1e-09      1e-12      1e-07      1e-05      2e-07
##
## $improve
## [1] "dualfeas" "thetagap"
##
## $infinite
## [1] 1e+30
##
## $maxpivot
## [1] 250
##
## $mip.gap
## absolute relative
##    1e-11    1e-11
##
## $negrange
## [1] -1e+06
##
## $obj.in.basis
## [1] TRUE
##
## $pivoting
## [1] "devex"    "adaptive"
##
## $presolve
## [1] "none"
##
## $scalelimit
## [1] 5
##
## $scaling
## [1] "geometric"   "equilibrate" "integers"
##
## $sense
## [1] "maximize"
##
## $simplextype
## [1] "dual"   "primal"
##
## $timeout
## [1] 0
##
## $verbose
## [1] "neutral"
```

Constrains

I add 9 constraints, because each constraint only contain 3 variables, choosing the set.row function is more appropriate.

```
set.row(lprec, 1, c(1, 1, 1), indices = c(1, 4, 7))
set.row(lprec, 2, c(1, 1, 1), indices = c(2, 5, 8))
set.row(lprec, 3, c(1, 1, 1), indices = c(3, 6, 9))
set.row(lprec, 4, c(20, 15, 12), indices = c(1, 4, 7))
set.row(lprec, 5, c(20, 15, 12), indices = c(2, 5, 8))
set.row(lprec, 6, c(20, 15, 12), indices = c(3, 6, 9))
set.row(lprec, 7, c(1, 1, 1), indices = c(1, 2, 3))
set.row(lprec, 8, c(1, 1, 1), indices = c(4, 5, 6))
set.row(lprec, 9, c(1, 1, 1), indices = c(7, 8, 9))
```

Now let us set the right hand side and specify the constraint types.

```
# set right hand side of constraints
rhs <- c(750, 900, 450, 13000, 12000, 5000, 900, 1200, 750)
set.rhs(lprec, rhs)

# set constraint type
set.constr.type(lprec, rep("<=", 9))

# set each decision variable for integer
set.type(lprec, c(1,2,3,4,5,6,7,8,9), "integer")   # each plant production units must be integer

# set bounds for above 0
set.bounds(lprec, lower = rep(0, 9))
```

Solve the Model

```
solve(lprec)
```

```
## [1] 0
```

Review results

```
# maximum profit
get.objective(lprec)
```

```
## [1] 707940
```

```
# each variable produce unit
get.variables(lprec)
```

```
## [1] 350   0   0 400 400 134   0 500 249
```

```r
# set row names
lp.rownames <- c("Plant1_Large", "Plant2_Large", "Plant_3_Large", "Plant1_Medium", "Plant2_Medium",
                          "Plant3_Medium", "Plant1_Small", "Plant2_Small", "Plant3_Small")
# make a data-frame
solution <- data.frame(lp.rownames, get.variables(lprec))
# change data-frame column name
colnames(solution) <- c("Variable", "Unit_Value")
# show the final result
solution
```

```
##        Variable Unit_Value
## 1  Plant1_Large        350
## 2  Plant2_Large          0
## 3 Plant_3_Large          0
## 4 Plant1_Medium        400
## 5 Plant2_Medium        400
## 6 Plant3_Medium        134
## 7  Plant1_Small          0
## 8  Plant2_Small        500
## 9  Plant3_Small        249
```

The maximum profit is 707940, and each plant & size produciton unit is shown in the above dataframe.